JJ-CCR

# JJ-CCR Rebreather

## eCCR User Manual

### (Version 1.00 / Revision 03)

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## Warning

**Do not attempt to use the JJ-CCR without attending a basic training or cross over course; even you are an experienced rebreather diver!**

## Warning

**This user manual does not replace a proper JJ-CCR training course, nor is it a guideline for CCR rebreather diving.**

## Warning

**As with any technology, a rebreather can also fail at any time! We strongly advise that you always carry enough bailout gas to comfortably finish the dive in OC mode!**

**Your knowledge, skills and practiced procedures are your best defense!**

## Warning

**If you don't agree with the above warnings – don't dive a rebreather at all!**

## Please read

**We highly recommend that you are take the time to read this user manual carefully!**

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## 1.1 Revision History

| Revision | Description |
|---|---|
| 00 | First revision of the JJ-CCR manual. |
| 01 | Pre and post dive check added |
| 02 | Changes for controller firmware 24 added |
| 03 | Changes for controller firmware 28 added |

# 2 Preface

Thank you very much for buying a JJ-CCR rebreather. We are sure that you will have many enjoyable dives with it.

The JJ-CCR rebreather has been designed and tested since 2006 with more than 1000 operating hours under water in different locations around the world.

The philosophy we follow with our product development is to strictly follow our design philosophy, which is based on the following criteria:

- Keep everything simple and stupid (KISS principle)
- The rebreather must be very strong, versatile and reliable
- The rebreather must be easy to use, maintain and service
- Use easily obtained parts to allow field repairs
- Support a wide range of tanks without the need of special adaptation
- Provide a complete – ready to use - package and not a basic unit with a hundred different additional options
- Provide very high redundancy. E.g. separate batteries for the controller, HUD and solenoid, none of them within the loop. And to allow the rebreather to be flown manually should the controller fail.
- Easy and reliable electronics – no useless high tech gimmicks and no “auto-pilot” effect. The diver has to be the only one in control of the rebreather and not the other way around
- Have sound scientific test data to backup the performance claims
- Always search for new ways to improve it

# 3 JJ-CCR Overview

## 3.1 JJ-CCR Features

- Very robust outer aluminium canister able to support up to 4 tanks (2 – 12 liter), attached with a standard cam-band.
- User packable scrubber (axial is standard and a radial is optionally available)
- Heavy duty technical stand or lightweight travel stand as option
- Front or back mounted counter lungs
- Redundant power sources: One battery for the controller, one battery for the HUD and two batteries for the solenoid. None of them within the loop
- Built in ADV (Automatic diluent valve)
- Build in BOV (Open circuit bailout valve)
- Manual oxygen adding valve with off-board gas connection option. Manual diluent adding valve is available as option
- Independent HUD with real-time display of the PPO2 for all three cells
- Reliable controller that includes a multi gas dive computer (Based on the Shearwater Predator).

## 3.2 Technical Specification

| | |
|---|---|
| Dimensions: | 70cm x 40cm x 26cm including the handle |
| Weight: | 32kg - ready to use with 2 x 3 liter tanks<br>19kg – without tanks and absorbent |
| Axial scrubber: | Absorbent: 2.3kg of Sofnolime 797<br>Duration: 168 min<br>Measurement: 40 Meters, 40 lt/min air, 1.6 lt/min CO2 |
| Radial scrubber: | Absorbent: 3kg of Sofnolime 797<br>Duration: 230 min<br>Measurement: 40m, 40 lt/min air, 1.6 lt/min CO2 |
| Batteries: | 2 x 3.6v Lithium (SAFT 14500). One for the controller and one for the HUD.<br>2 x 6v Lithium (Energizer CR-P2). Used in parallel for the solenoid |
| Counter lung volume: | 8 liter per counter lung |
| Depth limits: | Max. 40m with air diluent<br>Max. 100m with trimix diluent<br>Max. 185m depth limit controller handset<br><br>**WARNING: Diving deeper than 100m carries a lot of additional risk!** |
| Atmospheric range: | 800 – 1050 mbar |
| Oxygen first stage: | M26x2 - Intermediate pressure: 7.0 to 7.5 bar |
| Diluent first stage: | DIN 5/8”- Intermediate pressure: 9.0 to 10 bar |
| Oxygen control: | Two oxygen setpoints (low and high), switchable as often as required and under water changeable |
| Oxygen sensors: | 3 Galvanic cells – Teledyne R-22APD or JJ-CCR cells |
| Oxygen setpoint range: | 0.4 to 1.5 bar (low and high) |
| Oxygen warning: | Low 0.4 bar<br>High 1.6 bar |
| Operating temperature range: | Standard: +4°C to +32°C<br>Short term air: -10°C to +50°C<br>Long term storage: +5°C to +20°C |

# 4 How to assemble the JJ-CCR

This chapter covers a basic overview on how to assemble the JJ-CCR rebreather. Don't be afraid - You will not get the rebreather delivered in single pieces. The standard and the light version of the rebreather are already assembled. This chapter provides additional information for you to see how everything was put together and it is a guideline after disassembly of the rebreather for whatever reason, when you don't remember how it should be reassembled.

## 4.1 Main Body

The main body of the JJ-CCR is the aluminium canister. The rails you see on the picture are used for the tank straps and to keep the attached tanks in the correct position.

On the front of the canister you can see the two bolt holder and a tube on the left and right side.

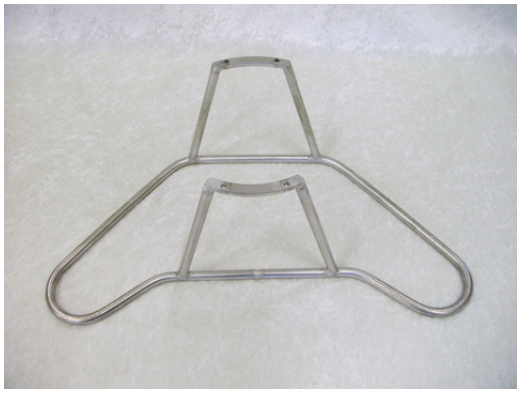
On the picture you can see which type of bolt should be used and how the bolt is inserted into the holder. The bolt is used to attach the wing, counter lungs and back plate afterwards. If you are planning to use a larger high than normal heavy duty back plate, you maybe have to replace the bolts with longer ones!

The following picture shows the handle that can screwed into the top of the tubes. The handle will allow you to easy lift the JJ-CCR rebreather in any situation. Before you mount the handle, we have to come back to the tubes on the left and right side. The tubes are used to add necessary trim weight. Important: The JJ-CCR rebreather does not change the overall trim whether you add trim weight into the tubes or not. The only difference is that you will need less weight on your weight belt.

There are two options to fill the tubes with additional weight. You can first put in a little piece of sponge into the tube and fill it up with lead shot. The sponge will prevent the lead shot falling through the hole in the bottom, but stills allows water to pass through. The second option is to insert the additional trim weight kit. The kit contains two weight rods (approx. 2.3kg per rod) which can be inserted into the tubes.

Here you see how you can screw the handle into the tubes.

The heavy duty technical stand is mounted to the canister with 4 screws. The heavy duty stand prevents the JJ-CCR from tipping over and during the dives it can be used as mounting point for your stages!



## 4.2 Hoses and First Stages

The next step in assembling the JJ-CCR is adding the first stages and hoses. During the development of the JJ-CCR we took care to have a very clear and easy hose routing on the rebreather and to only use a minimal quantity of them. This is one of reasons why the JJ-CCR looks so streamlined when fully assembled.

The first stage with the M26 handwheel and green submersible pressure gauge is used for oxygen. One of the LP hose will be connected to the head (feeding the solenoid) and the second one goes to the manual oxygen adding button.

The first stage with the DIN 5/8” handwheel and black submersible pressure gauge is used for the diluent. On this one, you will notice a very small Y-block with three ports. It is used to attach 3 LP hoses: One LP goes to the ADV, one to the wing inflator and the last one to the BOV.

On the next picture you can see how the first stages are attached to the tanks and the different hose routing of the HP and LP hoses! Please make sure, that you route the hoses exactly as seen on the picture!

The next picture shows the correct position of the Y-block and the two oxygen LP hoses. The hoses must lie flush with the canister.

## 4.3 Wing

The next step is to attach the wing. The JJ-CCR rebreather can be used with various types of standard wings that are available on the market. But not all of them will fit correctly. Very important are two points: The elbow for the corrugated hose has to be on the left side or in front of the left side (E.g. some DIR style wings that have it in the middle of the wing will not fit the JJ-CCR!). And the top of the wing should be as small as possible. Otherwise a fully inflated wing can press the breathing hoses together and impede your breathing comfort.

## 4.4 BMCL – Back Mounted Counterlung

The next item is the back mounted counterlung. The holes will allow you to mount it in different positions. On top of the counterlung you can see the ADV on the left and the T-piece with the manual oxygen inflator valve on the right side.

⚠ Please never use the ADV nor the t-piece to lift the rebreather. This can seriously damage the counterlung!

## 4.5 Back Plate and Harness

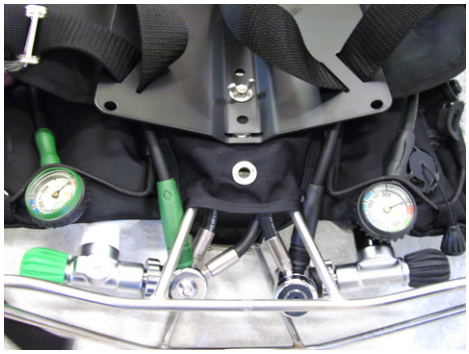
Now you can mount the back plate with the harness. On top of the counterlung you have on the left and right side webbing with Velcro. Open it – put in the harness – and then reclose it. Afterwards, it should look like the right picture.

You can use any standard back plate and any kind of harness with your JJ-CCR.

Attach the oxygen LP hose with the inflator connection to the manual oxygen adding valve. You can thread the manual oxygen adding valve through a D-ring as seen in the picture below. This is the best way to ensure it stays in the same position and you will never have to search for it during a dive.

Attach the shortest LP hose from the diluent first stage to the ADV. There are NO tools required – Please only hand-tighten - everything else is completely unnecessary. The second LP hose with the inflator connector is used for the wing inflator.

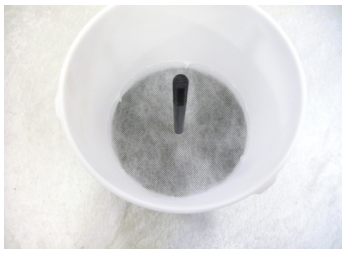
The next picture shows the standard position of the submersible pressure gauges. This position has many advantages. You can easily take a look at the pressure during the pre dive check, but during the dive they will not disturb you. If you would like to see the current pressure on your oxygen or diluent tank, you can very easily reach them and pull them forward. Of course you can also route the hoses over the shoulder if you want to always have them in front of you.



## 4.6 Scrubber

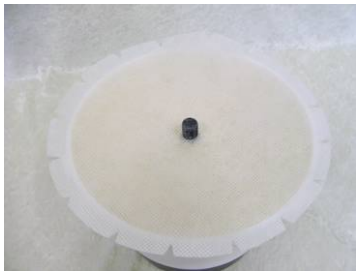
The standard JJ-CCR comes with an axial scrubber. As an additional option, a radial scrubber is also available.

Take one of the water resistant filters and put it into the bottom of the scrubber. Make sure that the filter is located probably on the bottom with no gaps around the edges!



Fill the scrubber approximately halfway and lightly tap around the scrubber to level the absorbent.

Fill the scrubber till there is a gap of 4-5mm on top. Slightly tap around the scrubber to level the absorbent. Afterwards place the second filter on top.



Fit the spring loaded pressure plate and hand-tighten the nut. Tap again around the scrubber to settle the absorbent. Tighten the nut carefully again. Please do not over-tighten! The scrubber is correctly filled, when you shake it and it does not rattle.

## 4.7 Lid

The lid and scrubber are connected by a ¼ turn and sealed by an o-ring. Please carefully inspect this o-ring prior to assembly! Do not over-tighten!

Prior to inserting the lid and scrubber into the canister, carefully inspect and lubricate the two o-rings. This is very important – otherwise the rebreather can leak and will not pass the positive and negative pre dive check!

Align the button with the hole!

Depress the button and start to gently push the lid down. When the button clicks out through the hole in the canister, you are done and the lid with the scrubber is in the correct position!

Take the controller and the HUD and pass them through the handle. Now connect the oxygen LP hose to the lid. Only hand-tighten!

Take the two breathing hoses and pass them through the handle as well. The setup should now look like in the picture below.

Connect the breathing hoses to the t-piece and to the ADV. To prevent incorrect assembly the thread on the inhale side is clockwise and the one on the exhale side is counter clockwise! Hint: The breathing hose from the centre of the lid is the one for the inhale side and has to go the ADV!

⚠ Please never use the ADV nor the t-piece to lift the rebreather. This can seriously damage the counterlung!

## 4.8 Breathing Hose with BOV

Now you can attach the breathing hose with the BOV. Before you attach the hose, please always check the flapper valves. The arrow on the top of the BOV shows the flow direction. The connection on the inhale side is clockwise and on the exhale side it is counter clockwise!

⚠ Please never use the breathing hose with the BOV to lift the rebreather. This can seriously damage the counterlung!

Take the HUD and pass it through the two o-rings on the breathing hose and press it into the HUD holder on the BOV. Take the last LP diluent hose and connect it to the BOV.

After this your JJ-CCR rebreather should look the same as in the picture below. This completes the chapter “how to assemble the JJ-CCR”.

**Warning: Your JJ-CCR is NOT ready to dive yet! First you have to do the complete pre dive check (Chapter 7).**

You will find more detailed information about the lid, ADV, HUD and controller within the corresponding chapters!

# 5 Main Components

This chapter will explain some of the main components of the JJ-CCR rebreather as well as some maintenance tasks required.

## 5.1 Lid

The lid with the three oxygen sensors, solenoid, battery compartment, the hardwired controller and HUD is the “brain” of the JJ-CCR rebreather. On the right side is the connection to attach to oxygen LP hose for the solenoid. The button on the left side is to switch on/off and calibrate the HUD. The cover with the “JJ-CCR.COM” engraving is the lid for the battery compartment. Important: Please always handle the lid with care!

### 5.1.1 Battery Compartment

To open the battery compartment of the JJ-CCR rebreather you have to remove the 10 screws. The JJ-CCR rebreather has very low power consumption! The batteries will last between 6-12 months, so you don’t have to open the battery compartment very often!

A unique design feature of the JJ-CCR rebreather is the location of the batteries. As you can see in the picture, none of the batteries lie within the loop and the battery compartment is completely sealed. By doing this the batteries will never have a moisture problem! The batteries are always at atmospheric pressure so you will also never have a problem with the batteries caused by fluctuating pressure during ascent and descent. Additionally, flooding the breathing loop will have no impact on the batteries!

The two 6v lithium batteries (Energizer CR-P2) are used in parallel for the solenoid. Please always replace **both** batteries at the same time! You can check the current voltage via the status screen on your controller! You will also get a low battery warning on the controller when the voltage is getting too low!

The 3.6v lithium (SAFT 14500) is used for the HUD. Please ensure that you install the battery into the holder the correct way. There is a "-" and "+" sign on the bottom of the housing. We recommend changing the battery for the HUD at the same time that you replace the other two batteries.

### 5.1.2 Oxygen Cells

The JJ-CCR rebreather uses three oxygen cells (Teledyne R-22APD or JJ-CCR cells).
The cells can be changed within seconds and there is no special tool required.

The numbers for the oxygen cells are 1, 2 and 3. You will find these numbers next to the connection for wires on the lid and also above each oxygen cell.

The JJ-CCR comes with 3 wires to connect the oxygen cells to the lid. The wire for cell 1 is the shortest one and for cell 3 the longest one.

### 5.1.3 Solenoid

The JJ-CCR rebreather uses a special low power consumption solenoid. The failure mode of the solenoid is always in closed position – this dramatically reduces the possible risk of an oxygen toxicity hit at depth. Servicing of the solenoid may only be carried out by the manufacturer or an authorized JJ-CCR service centre.

## 5.2 Controller

The JJ-CCR rebreather comes with a Shearwater Predator Controller, which also incorporates a multi gas (nitrox, trimix, heliox), multi mode decompression computer. The firmware has dedicated features and functions especially for the JJ-CCR rebreather.

Please refer to chapter 6 for a detailed description.

## 5.3 HUD

The JJ-CCR rebreather comes with a HUD. The HUD runs completely independently of the controller. It uses its own power supply and electronics.

The HUD monitors all three oxygen cells and displays each PPO2 via three LED's. Each one displays the value for one cell. The first LED on the HUD is for cell 1, the second for cell 2 and the third for cell 3. The cells numbers correspond to the display order on your controller as well! Each LED within the HUD is a dual color LED (green and red). If both LED's are on at the same time it will become orange.

The button to activate the HUD is on top if the lid. One push turns it on and another push will switch it off. Please make sure that you turn on the HUD, before you're in the water! Should you forget to do so, only your dive buddy can turn it on for you! When you turn it on and you get orange flashing LED's for 30 seconds it indicates low battery. If this is the case you should replace the battery for the HUD as soon as possible.

### 5.3.1 HUD Calibration

The calibration of the HUD should be done immediately after the calibration of the controller! We recommend to always calibrate the HUD and controller at the same time!

1. Open the oxygen tank valve
2. Open the mouthpiece (CC mode)
3. Switch on the HUD
4. Start the calibration sequence on the controller (Chapter 6.9)
5. As soon as the controller is calibrated, push the HUD button three times within one second! It might take a little practice to get this, but it is intended to prevent accidental calibrations.
6. If you successfully initiate the calibration sequence, all three LED's will be bright red for a few seconds. If you don't see that, the HUD is not calibrated!
7. After the bright red signal from all LED's they should flash orange once. That means the PPO2 is between 0.95 and 1.05. The actual value it uses for the calibration is 0.98. If a sensor fails the calibration, the LED for this sensor will flash once red and once green!!

### 5.3.2 HUD Reading

The HUD allows you to read the current PPO2 for each oxygen cell. This feature replaces the need for a second handset with a display! The reading of the HUD is also very easy and straight forward. One orange flash is showing a PPO2 of 1.00 (to be exact between 0.95 and 1.05). Each green flash is the number of tenths above a PPO2 of 1.0 E.g. three green flashes on one LED are a showing a PPO2 of 1.3 for this oxygen cell. Each red flash is the number of tenths below a PPO2 of 1.0. E.g. three red flashes on one LED are showing a PPO2 of 0.7 for this oxygen cell.

| Flashes | | | Description |
|---|---|---|---|
| **Cell 1** | **Cell 2** | **Cell 3** | |
| ● | ● | ● | Each LED flashes once orange with a short break between. This is showing a PPO2 of 1.0 for all three cells. |
| ● | ● | ● | Each LED flashes once green with a short break between. This is showing a PPO2 of 1.1 for all three cells. |
| ●<br>●<br>● | ●<br>●<br>● | ●<br>●<br>● | Each LED flashes three times green with a short break between. This is showing a PPO2 of 1.3 for all three cells. |
| ● | ● | ● | Each LED flashes once red with a short break between. This is showing a PPO2 of 0.9 for all three cells. |
| ●<br>●<br>● | ●<br>●<br>● | ●<br>●<br>● | Each LED flashes three times red with a short break between. This is showing a PPO2 of 0.7 for all three cells. |

The duration between flash sequences is always the same (around 5 seconds). If the PPO2 is more than 0.50 away from 1.00, the HUD increases the power to the LED's so they get brighter!

At a PPO2 of 0.20 you will see three very bright red LED's and they are flashing continuously! This is the HUD alert for a very low PPO2!

## 5.4 ADV (Automatic Diluent Valve)

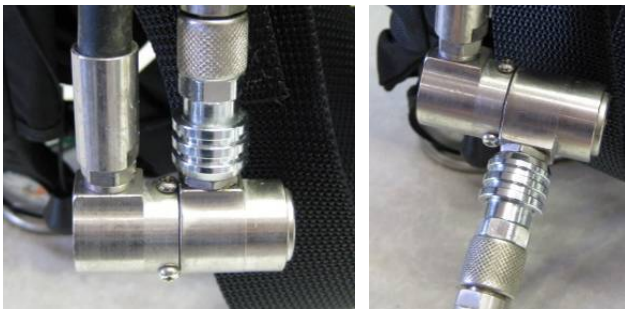
The JJ-CCR rebreather comes with an ADV (Automatic Diluent Valve). The ADV operates like a second stage and will automatically feed diluent into the loop when needed (= substantial negative pressure within the loop). The ADV requires no adjustment! You can also operate the ADV manually by pushing on the diaphragm cover.

⚠ Please never use the ADV to lift the rebreather. This can seriously damage the counterlung!

## 5.5 Manual Oxygen Add Valve

The manual oxygen add valve allows you to add oxygen into the loop. It will feed in more oxygen the longer the button is pressed. This allows a very accurate PPO2 to be maintained while using the rebreather in manual mode.

You can also unplug the hose and turn the valve around 180 degrees to attach an off board gas. E.g. your onboard oxygen is empty but you have a bailout stage with oxygen or another gas that you would like to manually add to the loop.



## 5.6 BOV (Bailout Valve)

The JJ-CCR rebreather comes with a bailout valve (BOV). The BOV is very compact and neutral in the water. It allows you, with just a little turn, to switch at any time from closed circuit to open circuit. There is a lever and a HUD holder on the BOV. The position of the HUD defines whether the BOV is in OC or CC mode. When you can see the HUD (e.g. the HUD is above the BOV as in the first picture below) you are in closed circuit (CC). When you can't see the HUD (as in the second picture below) you are in open circuit (OC).

Please attach the LP hose to the BOV only hand-tight! – Never use a tool for it!

⚠ You can adjust the regulator with a 3/16" Allen key. Turn it clockwise to increase and counter clockwise to decrease the breathing resistance.

# 6 Controller

The JJ-CCR rebreather comes equipped with a Shearwater Predator Controller, which also incorporates a multi gas (nitrox, trimix, heliox), multi mode decompression computer. The firmware has dedicated features and functions especially developed for the JJ-CCR rebreather.

## 6.1 General Overview

The controller is hardwired to the lid of JJ-CCR rebreather. The main part of the top face is the huge high resolution OLED display. On the right side, behind the small hole is the sensor for the ambient light. The OLED display automatically brightens as ambient light increases.

On both the left and right side is a button. Via these two buttons you have complete access to all operations of the controller.

On the right side is the battery compartment. This can be opened very easily with a coin. The 3.6v Lithium battery (SAFT 14500) is user changeable.

## 6.2 Features

- 320 x 160 pixel color OLED display
- Bluetooth interface
- Buehlmann algorithm decompression
- User configurable gradient factor conservatism
- Trimix, Heliox, Nitrox, Air gases
- Automatic switch on by depth, pressure or water contacts
- Automatic ambient light sensing OLED display
- Auto calibration mode
- User selectable oxygen percentage for calibration
- Configurable automatic or manual setpoint switching
- Setpoint (low and high) can be changed during a dive
- Setpoint and sensor values displayed while in menus
- Handset crush depth exceeds 185 meters
- 5 open and 5 closed circuit programmable gases
- Gases can be switched and changed during a dive
- No lockout
- Millivolt display for all cells „on demand“
- End user updateable firmware via Bluetooth
- High altitude diving mode
- Easy to read and very simple to use
- Adaptive menus
- Ascent rate display
- Battery warning (internal and external)
- Battery voltage display (internal and external)
- Metric and imperial
- CNS tracking
- Flip screen option
- PC download via Bluetooth
- Internal dive logbook

## 6.3 Switching-On

To switch on the controller you have to press both buttons simultaneously. After this you will briefly see the “JJ-CCR” logo on the screen followed by the main screen:

⚠ You should switch on the controller on the surface to get the current ambient pressure (used for high altitude decompression). If the controller switches on via the water contacts it will automatically take sea level as reference for the ambient pressure.

⚠ The controller switches off automatically after 10 minutes on the surface. But only when the water contacts are dry!

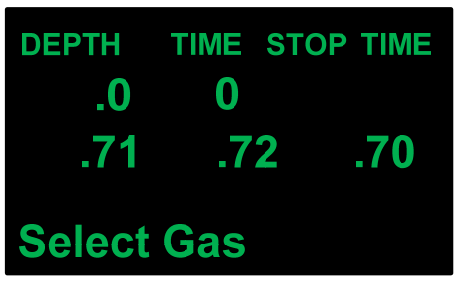
⚠ During the first 2 minutes after surfacing the controller stays in the surface mode, but during this time it cannot be switched off.

## 6.4 Buttons

Via the two buttons you can access the complete operation of the controller.

### 6.4.1 Left (MENU)

The left button (MENU) can be used to scroll through the menu. When the “Switch Setpoint” menu item is displayed, MENU will move to the “Select Gas” menu item.



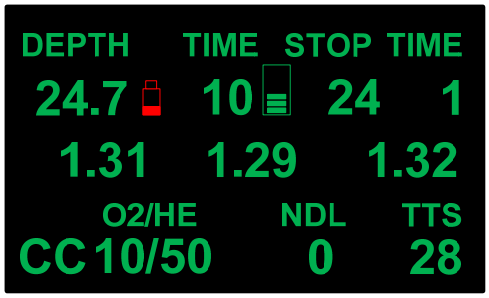
Or within the menu “Select Gas“, a short press on the left button will display the next gas.

### 6.4.2 Right (SELECT)

The right button (SELECT) is used to accept the current choice. E.g. when you press the right button (SELECT) within the “Switch Setpoint” menu, you will change the current setpoint to the displayed value (E.g. 1.3).

Or within the “Select Gas“ menu you accept the current choice:

## 6.5 Main Screen




The display has five rows. There are two title areas and three data display areas.

Across the top line is the title for the first row of information. This area only changes during the display of the dive log. The first data area shows depth, battery warning, dive time, ascent rate, first stop depth, and first stop time:

- It is showing a depth of 24.7 meters
- A low battery alarm. The low battery indicator glows yellow after the battery registers less than 3.28V for 30 seconds. Below 3.15V the battery indicator will flash red and you will need to change the battery immediately.
- 10 minutes of dive time.
- A 6 meter per minute ascent rate. The ascent rate indicator shows 6 levels of ascent rate. Each block represents either 10 fpm or 3 mpm. The first three bars are displayed in green. 4 to 5 bars are displayed in yellow and all 6 bars together are displayed in red. When the ascent rate is greater than 6 units, the whole block will be filled in red and starts to flash.
- Stop at 24 meters for 1 minute. If you are above the indicated stop depth, the stop depth will flash.
- The next line has the three O2 sensor readings. They will display PPO2 normally, but if both buttons are pressed simultaneously, the display briefly switches to mV status display for a few seconds. If a sensor is voted out, it will display the current value in yellow and it will flash. The value will not be considered in the average PPO2. PPO2 values below 0.4 or higher than 1.6 will flash red.
- The next row is the title for the bottom line. This title changes frequently in the menu system to provide additional information about the bottom line.
- The controller is in closed circuit (CC) mode.
- The actual used gas is a 10/50 trimix (10 % oxygen and 50 % helium). If there is a gas programmed in the current mode (OC or CC) that would normally be used at the current depth, the system will display the gas contents in red to remind you to either switch gases, or remove the gas if you aren't using it.
- The no decompression limit (NDL) is zero since we are in decompression, and the time to surface (TTS) is 28 minutes.

The controller works in both metric and imperial for depths and temperatures. The depth shows a decimal point when the depth is between 0 and 99 meters. It shows no decimal point if the display is set to feet.

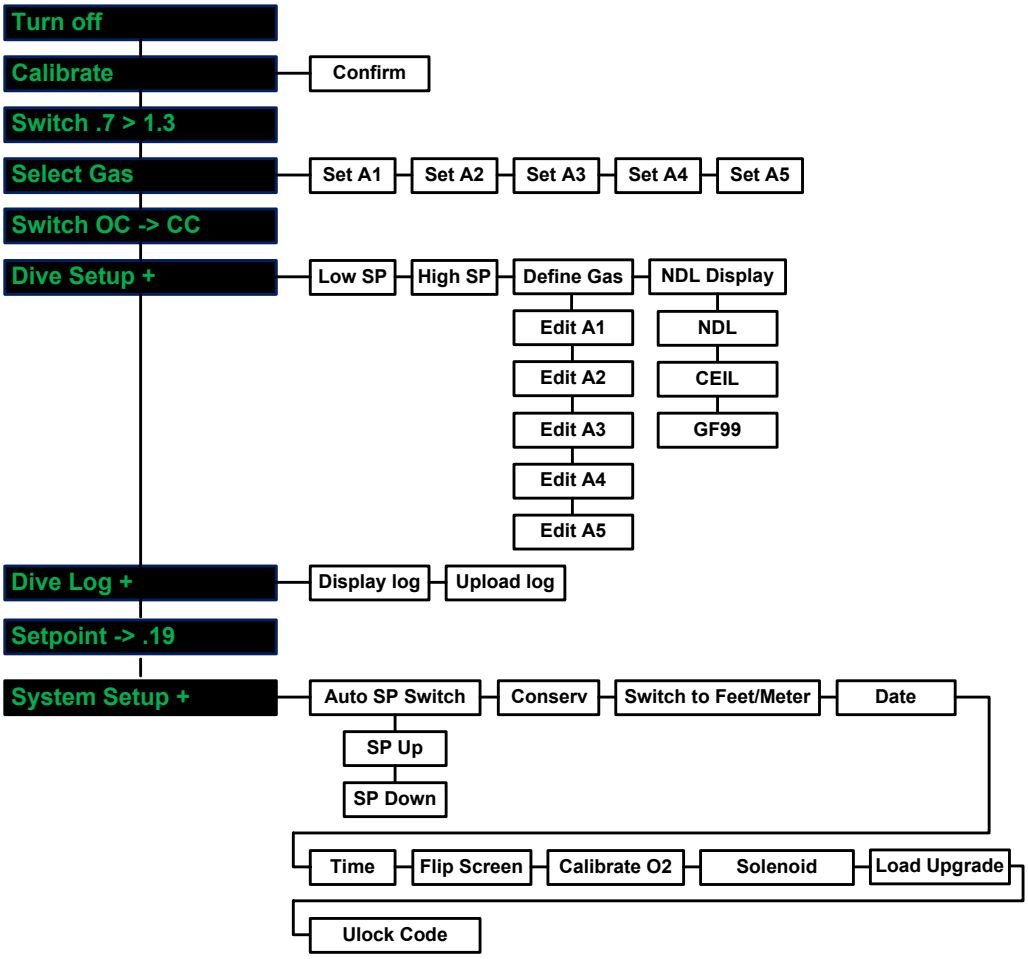
## 6.6 Menu

The system is designed to allow easy selection of the common operational functions whilst diving. The menu selections are separated into two sets. The “Operation” menu provides easy access to commonly used functions. The “Setup” menu is used to change system settings.

The system will continue to read the sensors and update the sensor display while you are in the menu system. If no buttons are pushed for a few minutes, the menu mode will time-out. Anything that had been previously saved will be retained. Anything that was in the middle of editing will be discarded.

A key characteristic of the menu system is that it is adaptive. It uses the information that it knows about its current state to only ask questions or offer menu items that make sense given the current situation. For example, on the surface, the first menu item you will see is Turn Off. During a dive, the Turn Off menu item doesn’t appear. The second menu item is Calibrate. That item also only shows on the surface.

The full menu structure is as below:



## 6.7 Menu Reference

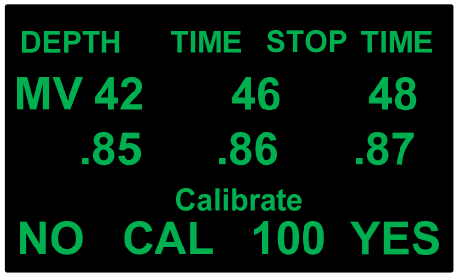
This chapter explains all menus of the controller.

## 6.8 Turn Off

The “Turn Off” item puts the controller to sleep. This menu item will only appear if the water contacts are dry on controllers. While sleeping, the screen is blank, but the tissue contents are maintained for repetitive diving.

⚠ **The “Turn Off” menu item will not appear during a dive**
⚠ **It will also not appear for 2 minutes after a dive to allow for a continuation dive**

## 6.9 Calibrate




This will calibrate the sensor displays to oxygen. The JJ-CCR rebreather controller has a in-built automatic calibration. Please set the calibration gas to 100% of oxygen!

1. Open the oxygen tank valve
2. Open the mouthpiece (CC mode)
3. Go to the “Calibrate” menu (Make sure that the calibration gas is 100% oxygen!)
4. Select “Yes” by pressing the right button

5. The solenoid will now start to feed oxygen into the loop, until the millivolt readings are stable and do not change any more! It can take some time – be patient!
6. The calibration is successfully completed as soon as the controller reverts back to the main display.

Good sensors should be in the range of about 35-60 mV at sea level in oxygen. If any display shows FAIL, the calibration has failed because the mV reading is out of range.

During calibration, display of O2 Cell millivolts turns yellow when millivolts are outside of acceptable range (range varies with O2% and altitude, but at 1 ATM and 98% O2, the acceptable range is 30mV to 70mV).

The calibration takes into account the altitude at which the controller was turned on. For example, if the altitude was 885 mBar or .87 ATA, then with a 98% calibration gas, the sensors would calibrate to .85.

The “Calibrate” menu item will not display during a dive.

### 6.9.1 PPO2 Monitoring

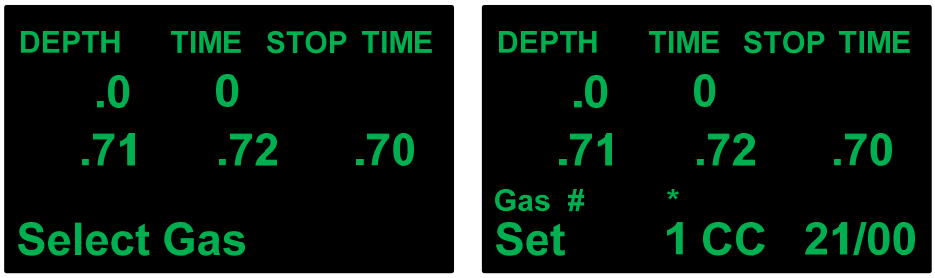
The PPO2 used to calculate the decompression is the average of all three sensors after voting. This is the case when no sensor has been voted out. A sensor that has been voted out is displayed in yellow and starts flashing. In this case the decompression calculation will use the average of the two left over sensors. PPO2 values below 0.4 or higher than 1.6 will flash red.

After switching to OC, the PPO2 used for the calculation will be the PPO2 of the selected gas at the current depth.

## 6.10 Switch Setpoint

When SELECT is pushed with either of these displays, the displayed setpoint on the right will be selected. During a dive, the “Switch Setpoint” menu item will be the first item displayed. The “Turn Off” and “Calibrate” displays are disabled.

## 6.11 Select Gas




This menu item allows you to pick a gas from the gasses you have created. The selected gas will be used either as the diluent in closed circuit mode, or the breathing gas in open circuit mode.

Gasses are always ordered from the most to least oxygen content. Press the “Confirm” button when “Select Gas” is displayed, and the first available diluent will be displayed.

Use the MENU button to increment the diluent to the one you want, then press the “Confirm” button to select that diluent. If you increment past the number of gasses available, the display will fall back out to the “Select Gas” display without changing the selected gas. Use the “Confirm” button to select a gas. The bottom line of the display shows the selected gas.

The system maintains two sets of gases - one for open circuit and one for closed circuit. The way they operate is very similar to the way car radios work with AM and FM stations.

When you are listening to an FM station and you push a station selection button, it will take you to another FM station. If you add a new station, it will be an FM station. Similarly, if you are in the AM mode, adding or deleting a station would add or delete an AM station. With radio station gases, when you are in open circuit, adding, deleting or selecting a gas will refer to an open circuit gas. Just like the way FM stations are selected when your radio is in FM mode, only closed circuit gasses are available in the closed circuit mode. When you switch to open circuit, the gasses available will be open circuit gasses.

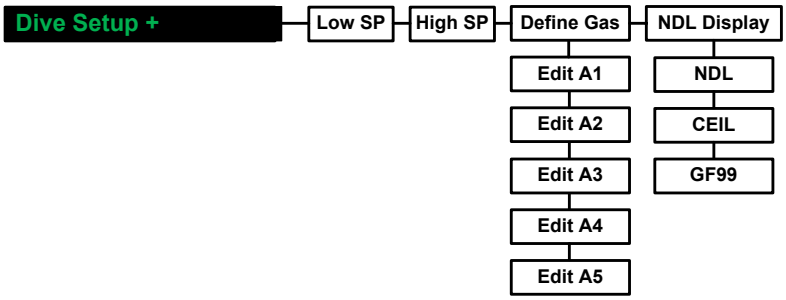
## 6.12 Switch OC/CC

Depending on the current controller setting, this selection will show as either “Switch CC -> OC” or “Switch OC -> CC.” Pressing SELECT will select the displayed mode for decompression calculations. When switching to open circuit while diving, the most appropriate open circuit gas will become the breathing gas for calculations.

At this point, the diver may want to switch to a different gas, but since the diver may have other things to deal with, the controller will make a “best guess” of which gas the diver would choose.

## 6.13 Dive Setup+

Pressing SELECT will enter the Dive Setup sub-menu:



### 6.13.1 Low SP (Low Setpoint)

This item allows you to set the low setpoint value. It will display the currently selected value. Values from 0.4 to 1.5 are allowed.

Press the “Confirm” button when “Low SP” is displayed and the edit SELECT display will be shown. It is set at the lowest valid value for setpoint: .4.

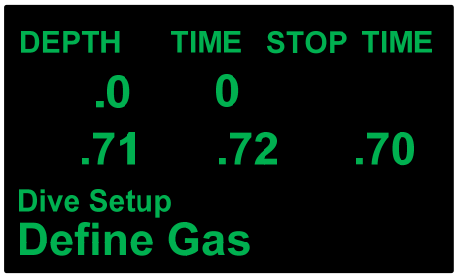
Pressing MENU will increment the setpoint. Another press of MENU will increment it again.

If SELECT is pushed, the currently displayed setpoint will be selected, and the display will return to the “Low SP” menu item. If the highest allowable value, 1.4, has been passed, the menu will also revert to “Low SP” without changing the original setting.

### 6.13.2 High SP (High Setpoint)

The high setpoint function works exactly like the low setpoint function.

### 6.13.3 Define Gas




This function allows you to set up 5 gasses in Closed Circuit and 5 gasses in Open Circuit mode. You must be in Open Circuit to edit open circuit gasses, and you must be in Closed Circuit to edit closed circuit diluents. For each gas, you can select the percentage of oxygen and helium in the gas.

Pushing SELECT when “Define Gas” is displayed presents the function to define gas number 1. Pushing the MENU button will display the next gas. Pushing SELECT will allow you to edit the current gas. The gas contents are edited one digit at a time. The asterisk will show you the digit being edited.

Pushing SELECT saves the current digit and moves on to the next digit. Each push of the MENU button will increment the digit being edited. When the digit reaches 9, it will roll over to 0. Pushing SELECT will lock in the current digit, and move on to the next digit.

Pushing SELECT on the last digit will finish editing that gas, and bring you back to the gas number.

Any gasses that have both oxygen and helium set to 0 will not be displayed in the "Select Gas" function. Pushing MENU will continue to increment the gas number.

**Note: The "A" denotes the active gas. You cannot delete the active gas. If you try, it will generate an error. You can edit it, but you cannot set both the O2 and HE to 00.**

The controller will display all 5 gas entries available to allow you to enter new gasses.

Pressing MENU one more time when the fifth gas is displayed will return you to the "Define Gas" menu item.

### 6.13.4 NDL Display

The NDL Display option allows you to display three different values during the dive. The display can be changed during the dive to provide different information.

Pushing SELECT will take you into the edit menu. The first choice available will be NDL. If you select NDL, the NDL will always be displayed during the dive whether or not you have a decompression ceiling.

The next selection is CEIL. With this setting, as long as the NDL time is 0 (you have a decompression ceiling), the raw ceiling will be displayed instead of the NDL. This is the equivalent of the 'Man on a rope.' It will show your ceiling without it being rounded up to the next even 10 foot or 3 meter stop. Please note that there is very limited information on the effects of following a continuous ceiling instead of formal stops and only moving up to the next stop when the current stop has cleared.

The manufacturer of the controller holds the opinion that all stops should be honored. It seems intuitive that if you have bubbles, and you stop, you give the bubbles an opportunity to be reabsorbed. If you continuously ascend, the ambient pressure is continuously reduced which prevents bubbles from shrinking. Due to this belief, the controller will give one Missed Deco Stop message during the dive and one after the dive, and will flash the stop depth as long as you are above the stop depth. It will use the increased gradient though, and your calculated off-gassing will be faster than staying at the stops.

The final option is to display the actual supersaturation gradient for a pure Buehlmann (99/99) profile. The selection is GF99. With this setting, as long as the NDL time is 0 (you have a decompression ceiling), the gradient will be displayed instead of the NDL.

The number shown is the percentage of supersaturation. The number is calculated by reference to the Ambient Pressure Line and the M-Value line. It can be thought of as the current GF, but it is different in a couple of ways. First, the current GF generates stops rounded to the nearest 10 feet or 3 meters. So a gradient of 40 may reflect a ceiling of 15 feet, but the controller will show a rounded-up 20 foot stop.

Also, GF draws a line at the beginning of decompression from the deepest stop to the surface. The gradient used for stops is based on that line. The Buehlmann ceiling is a raw supersaturation ratio.

This number can be used in several ways. First, it can be used to calculate an aggressive ascent that still has some justification in decompression science. For example, if a diver were to lose a significant portion of their gas and needed to get shallow fast, they could ascend until they reached a gradient of 90, then stop until it dropped to 80, then ascend to 90 again, etc. That would produce a Buehlmann-like profile with very little conservatism. In an emergency, that may be an acceptable risk.

Another use might be to do a slower ascent on a sightseeing dive, but to stay in the decompression zone by keeping the gradient above 0.

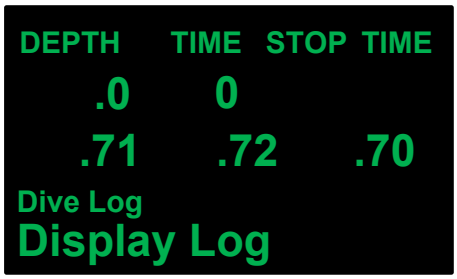
Another use would be to observe the rapidly increasing gradient in the last 10 feet to the surface and slow that ascent.

All of this is based on gradient theory that may be completely false. There is significant disagreement in the decompression research community about the nature and practice of decompression. Any techniques described here should be considered experimental, but the concepts may be useful to the advanced diver.

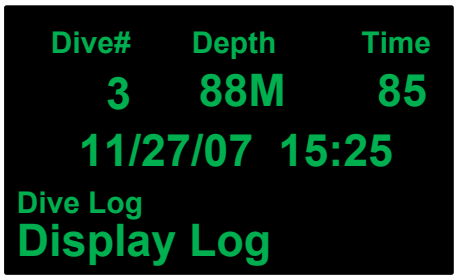
## 6.14 Dive Log+

The dive log menu item will not appear during a dive. The log can only be examined or uploaded on the surface. The dive log submenu is accessed by pressing SELECT.

### 6.14.1 Display Log



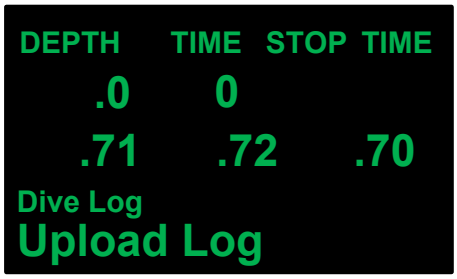

The first menu item within the “Dive Log” mode is the “Display Log” item. Pressing SELECT will display the last logged dive.




Each time MENU is pressed, the controller will display an earlier dive until all of the stored dives have been displayed. The system will store about 20 hours of dives.

Pressing MENU when the last dive is displayed will exit the menu. Pressing SELECT on any dive will complete the log viewing and move to the next sub menu item.

### 6.14.2 Upload Log

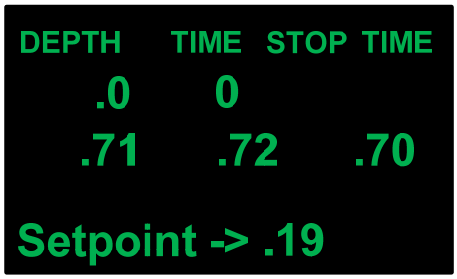



The second menu item is “Upload Log.” Pressing CONFIRM will set up the system to upload the stored log information via Bluetooth.

The Windows software is provided free for download on the Shearwater website.

## 6.15 Setpoint -> .19

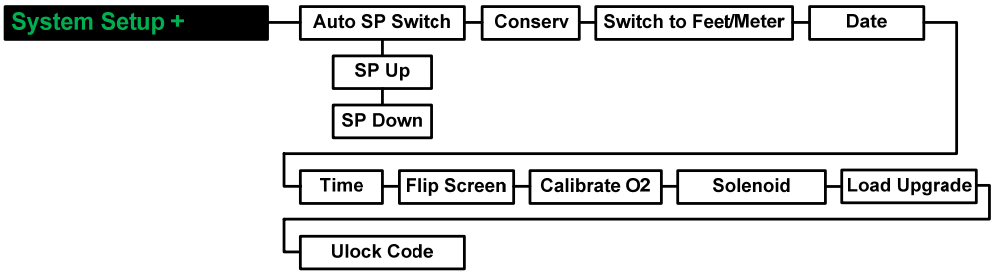
This menu item will only be displayed on the surface. It allows the solenoid to be turned off while on the surface when the loop is exposed to air. This prevents the solenoid from firing continuously. It is mainly used while uploading logs or other maintenance functions.



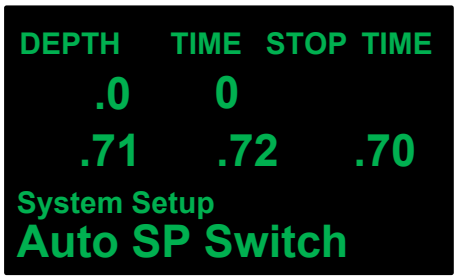

To switch back to normal low setpoint, select the Switch Setpoint menu item. The setpoint will also switch to normal low setpoint if a dive is started with the .19 setpoint selected.

## 6.16 System Setup+

System Setup contains configuration settings that are only set between dives. This menu item doesn't appear during dives. Each of the items in the System Setup menu can only be accessed on the surface.




### 6.16.1 Auto SP Switch




Auto setpoint switch configuration sets up the setpoint switching. It can be set up to switch up only, down only, both, or neither.

Pushing the confirm button will go into the setup for the switch up function.

This configures the switch up from the low set point to the high setpoint. Pushing SELECT will enter the edit mode.

An asterisk shows which item is being edited. On first entry to edit mode, the “On/Off” position will be selected. Pushing MENU switches it back and forth between “On” and “Off.”

Pushing SELECT moves to the next edit item. We are now editing the first digit of the switch depth. Pushing SELECT increments the digit. Pushing SELECT moves to the second digit.

Each push on MENU increments the digit.

SELECT on the last edit position saves the settings and exits the edit function.

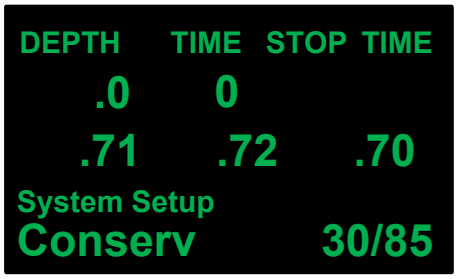
The “SP Down” item configures the switch from high setpoint to low setpoint. You configure it the same way as the “Up” setting.

Either switch can be turned on or off independent of the other switch.

The system limits the allowable setpoint settings. Switching up is allowed from 20-999 feet and from 6-999 meters. Switching down is allowed from 9-999 feet and from 2-999 meters.

If you enter a setting that is outside the allowed range, the existing (valid) setting is retained with no change.

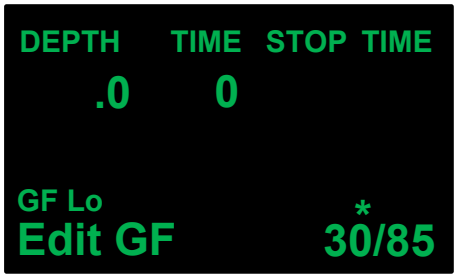
### 6.16.2 Conservatism



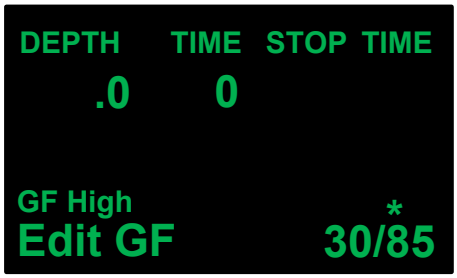

The controller implements Gradient Factors by using levels of conservatism. For a more detailed explanation of their meaning, please refer to Erik Baker’s excellent articles: *Clearing Up The Confusion About “Deep Stops” and Understanding M-values.* The articles are readily available on the web. You might also want to search for “Gradient Factors” on the web.

Pressing SELECT will enter the GF edit mode.

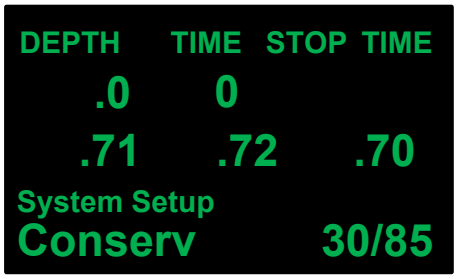
Pressing MENU will increment the digit.




SELECT will save the current digit and move on to the next digit.



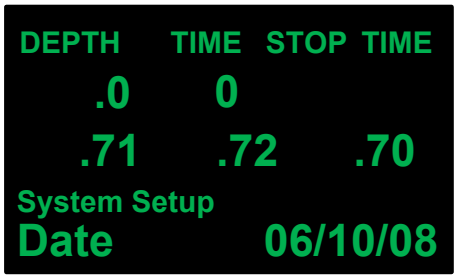

SELECT on the last digit will save the new conservatism setting and return to the Conservatism menu item.




### 6.16.3 Switch to Feet/Meter

Each push of SELECT switches back and forth between meters and feet. It also switches the temperature scale. The menu item always shows the destination. If the display is “Switch to Meters”, then the current setting is feet.

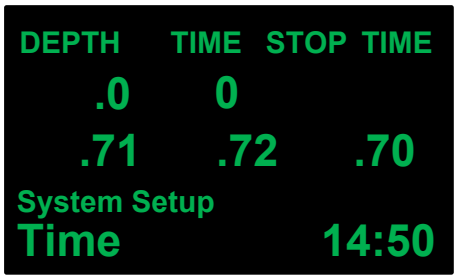
### 6.16.4 Date



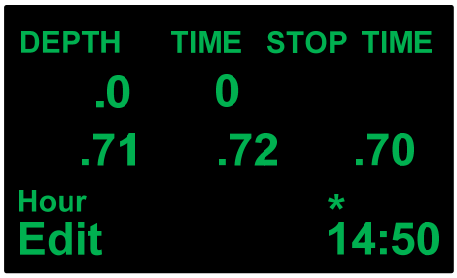

The date menu item allows the date to be set. Enter the edit function by pressing CONFIRM. The date is edited like other items by using MENU to increment and the SELECT button to accept the digit.

The date and time will have to be re-entered after a battery change.

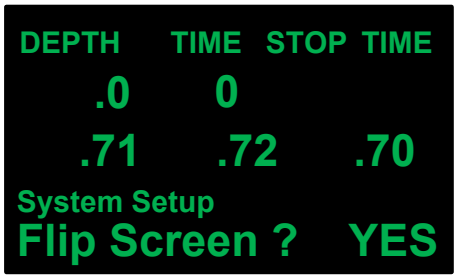
### 6.16.5 Time




The time menu item allows the time to be set. Enter the edit function by pressing SELECT. The time is edited like other items by using the MENU button to increment and the SELECT button to accept the digit.

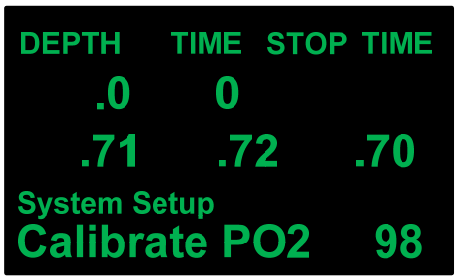


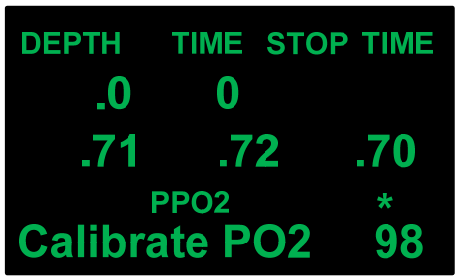
### 6.16.6 Flip Screen




This function displays the contents of the screen upside down. This is used for systems with a permanent connection to a rebreather. It allows the controller to be worn on the right arm. The functions of the two buttons will also be rotated.

### 6.16.7 Calibrate O2



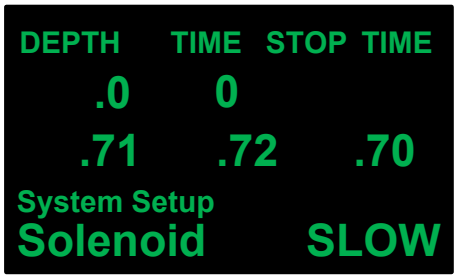




This allows the user to set the expected PPO2 for calibration. When pure oxygen isn't available such as when the oxygen is generated by a membrane system. The oxygen in that case might be 96% O2 with a few percent of Argon.

If any change is made in this screen, the current calibration will be discarded. The controller must be re-calibrated with the new settings.

⚠ **For the JJ-CCR rebreather, please set it to 100 when you are using pure oxygen!**

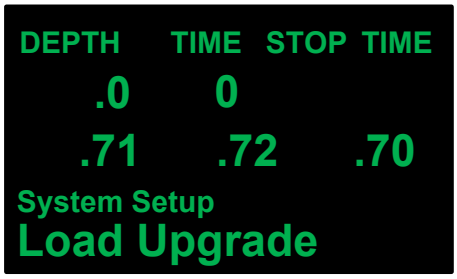
### 6.16.8 Solenoid Speed




The firing pattern of the solenoid can be changed between fast and slow. The FAST setting uses frequent short injections of oxygen and is generally more accurate.

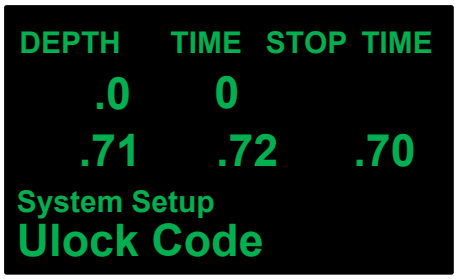
The SLOW setting is more familiar to many users and this is the default setting on the JJ-CCR rebreather.

### 6.16.9 Load Upgrade




This function is used to load software updates.

### 6.16.10 Ulock Code




The unlock code is entered to change models and to set other features. It serves a variety of purposes.

As in other functions, MENU increments and SELECT saves and moves to the next digit. SELECT on the last position ends the function. Invalid codes are rejected without changing the existing features.

The numbers are in the hexadecimal system. The digits are 0-9 and A-F. They represent a base-16 number system commonly used to represent large numbers compactly.

Pressing SELECT when not in a menu will bring up the status displays. There are several status displays, and each push SELECT will move to the next display. Another SELECT push with the last display shown will return to the primary display. The status displays will time-out after about 6 seconds and return to the primary display.

The status displays vary depending on the model. For example, the OC versions don't show the diluent PPO2 since it is the same as the Average PPO2 shown on the first status display.

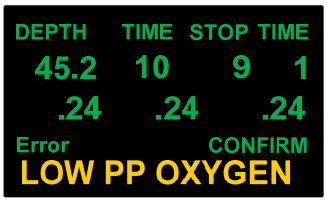
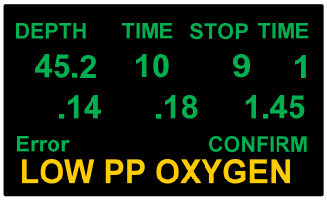
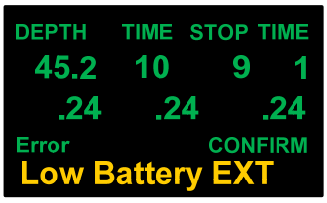
| Status Displays | Description |
|---|---|
| OC Mode<br> <br><br>CC Mode<br> <br> | **OC Mode**<br>46.1 = Maximum depth on the current or previous dive<br>23 = The current CNS exposure<br>.21 = Current PPO2<br><br>**CC Mode**<br>46.1 = Maximum depth on the current or previous dive<br>23 = The current CNS exposure<br>.7 = The actual setpoint<br>.70 The average measured PPO2 |
| OC Mode<br> <br><br>CC Mode<br> <br> | **OC Mode**<br>984 = The barometric pressure in millibars<br>30/85 = The conservatism setting<br><br>**CC Mode**<br>.21 = PPO2 of the active diluent<br>984 = The barometric pressure in millibars<br>30/85 = The conservatism setting |
| <br> | The next display shows the altitude that the controller was at when it was turned on. This altitude is saved and used for depth, O2 sensor calibration, and decompression calculations.<br><br>It is important to turn the controller on before diving to adjust the altitude |

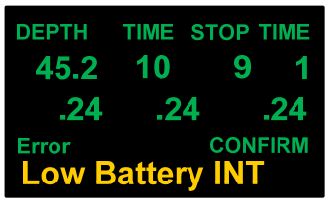
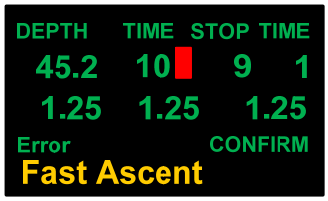
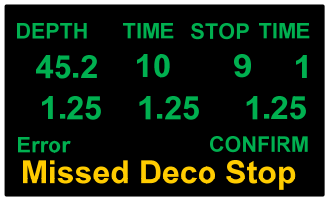
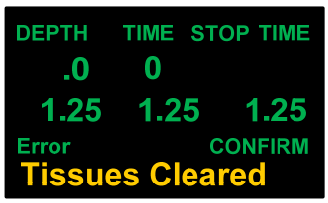
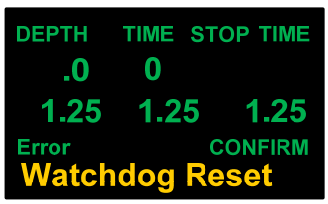
| | |
|---|---|
| | The next display shows the water temperature, the voltage of the external solenoid battery, and the voltage of the internal 3.6V lithium battery. The external (solenoid) battery is only updated when the solenoid is firing. This is done because the battery voltage can be erroneously high when solenoid is not on. If you see Ext. V = 0.0 after turning on, this may be because the solenoid has not yet fired. |
| | The next display shows the current millivolt coming from the oxygen cells. |
| | This display shows the actual date and time. |
| | This display is not available during a dive. It shows the current surface interval. |
| | The last display shows the serial number, model and version of the controller. The version is in three parts. The first number is the model. The three models are 1 for display, 2 for controller, and 3 for controller. The next 4 digits are feature configuration. For example they control whether helium is enabled. They also control customization. The last two digits are the software version |

## 6.17 Error Displays

The system has several displays that alert an error condition. All of these displays share a common limitation of error alarms. There is no way to distinguish between an error alarm that is not in alarm and an error alarm that is broken. For example, if an alarm is silent when it is not in alarm and is silent when it is broken, then there is no way to be sure that the alarm isn't broken. So by all means respond to these alarms if you see them, but NEVER depend on them.

Each of the alarms will display the message in yellow until dismissed. The error is dismissed by pressing SELECT. Other functions continue to operate as normal, so that the MENU button will take you into the menu, and a push on both buttons will show the millivolt display. The error message will keep returning until it is dismissed with a SELECT.

| Error Displays | Description |
|---|---|
| **High PP02**<br> | This message will appear if the average **PPO2** goes **above 1.6** for more than 10 seconds. It will come back after being dismissed if the situation occurs again |
| **Low PP02**<br>  <br>  | This message will appear if the average **PPO2** goes **below 0.4** for more than a few seconds. It will come back after being dismissed if the situation occurs again.<br>Another condition will also cause the "Low PPO2" display to appear: the controller does not have two sensors that have confirming values (as seen on the second picture). There is no way to know the actual PPO2, and the average PPO2 will be calculated as 0.00. |
| **Low Battery EXT**<br>  | This alarm appears when the voltage on the external solenoid batteries is low. The solenoid may still be firing, but the batteries must be replaced before any further diving. |

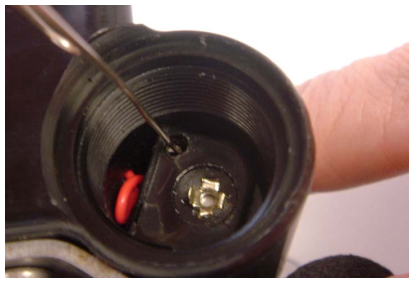
| | |
|---|---|
| **Low Battery INT**<br>  | This alarm shows that the internal battery in the controller needs to be changed. The controller will flash the battery symbol in red and show a text message. |
| **Solenoid Alert**<br> | If this alarm occurs, corrective action must be taken at once. Even if the solenoid can be heard to fire, it is not functioning correctly. |
| **Fast Ascent**<br>  | This alarm is a notification that there has either been a very fast ascent for a short period of time, or that there has been an ascent of more than 66 fpm / 20 mpm maintained for over a minute. This alarm may return after being dismissed if the condition occurs again. |
| **Missed Deco Stop**<br>  | The alarm occurs when the diver has been above the minimum depth for a decompression stop for more than one minute. This alarm will only appear once during a dive, but it will also appear once on the surface after the dive. |
| **Tissues Cleared**<br>  | This alarm will show every time the controller loses power. All decompression information has been lost. |
| **Watchdog Reset**<br>  | This alarm happens when the computer does not complete all of its tasks in the time allotted. It can happen occasionally from a transient problem like a battery bounce after an impact. It can also be the result of a hardware problem. |

| | |
|---|---|
| **Upgrade Reset**<br> | This reset shows up after a software update. It shows that the computer has been rebooted after the software update. |
| **Brownout Reset**<br> | This error usually occurs when the battery dies while the computer is asleep. If the battery gets too low to maintain system integrity, the hardware will force the system into reset. |
| **Internal Hardware Failures**<br> <br> <br> <br> | The following messages are reporting internal hardware failures. The system will continue to retry and may recover, but they would normally mean that something that should never happen, has happened. These messages should always be recorded and reported to the factory or your local service center.<br><br>This is not an exhaustive list. There are other errors that could be reported and more checks are added with each software update. |

## 6.18 Battery Change

The controller has a battery compartment in the side of the case. To access it, unscrew the battery cap with a large coin.

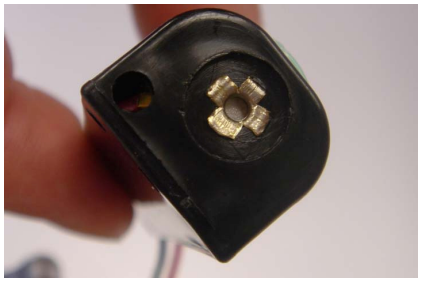
Carefully pull out the battery holder. To prevent battery bounce and rattling, it's a tight fit, so you will need something like a dental pick or a paper clip to pull out the holder.



Pull out the battery holder and change the battery. The battery is a Saft 14500

The wires come from the main compartment of the controller through to the battery compartment on one side of the battery compartment.

The bottom of the battery holder is flat.



The bottom needs to be aligned with the wires as they feed through the case. Carefully fold the wires along the bottom of the holder and insert back into the compartment. Care must be taken not to pinch and score the wires.

Inspect and, if necessary, apply a light coat of silicone to the O ring in the battery cap. Reinstall the battery cap taking care not to pinch or deform the O ring. Finger tighten with a coin.

# 7 Pre Dive Check

This chapter covers the complete pre dive check list of the JJ-CCR rebreather. Please use it all the time you are planning to do a dive with the unit:

## 7.1 Preparing on Land

| Step | Description |
|---|---|
| 1 | **Do you feel yourself healthy?** If not – please do not dive! |
| 2 | Do you still have remaining scrubber time for the planned dive? If not – change the scrubber. Never try to save some money on absorbent. |
| 3 | Analyze the content of your oxygen and diluent cylinders. Is there enough pressure in both cylinders for the planned dive? |
| 4 | **Don't forget to have sufficient bailout for the dive**, taking into account a worst case scenario. You can never carry too much bailout gas! |
| 5 | Mount the tanks on the rebreather. |
| 6 | Mount the lid with the attached scrubber in the rebreather. |
| 7 | Do a negative and positive pressure check for the lid. |
| 8 | Attach all hoses and take care with all o-rings. Ensure that the flapper valves within the BOV (breathing hose) are working correctly |
| 9 | Open the two tank valves and check the submersible pressure gauges. |
| 10 | Check the manual adding valves and the ADV |
| 11 | Check the wing inflator |
| 12 | Check the BOV bailout regulator |
| 13 | Make a positive pressure check: Use the mouthpiece to fill the loop completely with air. The t-pieces have to come into a horizontal position. Close the mouthpiece and wait. The positive check is successful, when the t-pieces stay in the horizontal position and do not sag down! |
| 14 | Pull the diluent dump valve to make sure that the dump valve is working correctly. |
| 15 | Make a negative pressure check (Close tank valves): Use the mouthpiece and create a vacuum within the loop. The indication for a proper vacuum is the position of the ADV diaphragm. Close the mouthpiece and wait. If the position of the ADV diaphragm does not change the negative pressure check is OK. Also when you open the mouthpiece and you hear air being sucked in, this also shows that the test was successful. |
| 16 | Reopen the tank valves |
| 17 | Open the mouthpiece (CC Mode) |
| 18 | Switch on and check the controller and HUD |
| 19 | Calibrate the oxygen cells with the controller and afterwards with the HUD. |
| 20 | Breath for 2 -3 minutes and observe the correct scrubber function |
| 21 | Close the Mouthpiece (OC mode) |
| 22 | Switch off the controller and HUD |
| 23 | Close the two tank valves |

## 7.2 Before Dive

| Step | Description |
|---|---|
| 1 | Open the two tank valves and check the submersible pressure gauges |
| 2 | Check the manual adding valve and ADV |
| 3 | Check wing inflator |
| 4 | Check the BOV bailout regulator |
| 5 | Check the BOV mouthpiece function (Switch OC/CC mode) |
| 6 | Make a positive and negative pressure test of the loop |
| 7 | Switch on the HUD and controller |
| 8 | Check the low and High setpoints settings within the controller |
| 9 | Open mouthpiece and breath for 2-3 minutes |

It is highly recommended that you perform a bubble check within the first meters of your dive. Never start your descent without doing this check!

# 8 Post Dive

This chapter covers the complete post dive list of the JJ-CCR rebreather. Please use it after every dive:

| Step | Description |
|---|---|
| 1 | **Do not close the tank valves before you have removed the rebreather.** |
| 2 | Switch off the controller and dry the water contacts. |
| 3 | Switch off the HUD. |
| 4 | Close both tank valves. |
| 5 | Remove the breathing hose with the BOV. |
| 6 | Remove the lid with the scrubber. |
| 7 | Remove the scrubber from the lid. |
| 8 | Let the lid and scrubber dry. |

Steps 5 – 8 are only needed when you are not planning an additional dive on the same day.

# 9 Cleaning

You can do either a “light“ or “full” clean on the JJ-CCR. The “light” cleaning is very easy and can be done during the dives, if needed. The following steps are required for “light” cleaning:

## 9.1 “Light” Cleaning

| Step | Description |
|---|---|
| 1 | Remove the breathing hose and rinse it with fresh water. |
| 2 | Pour some warm fresh water into the **exhale side only** of the counter lung and remove it via the diluent dump valve. |
| 3 | Remove the lid with the scrubber. |
| 4 | Remove the scrubber from the lid. |
| 5 | Let the lid and scrubber dry |

## 9.2 “Full” Cleaning

The full cleaning should be done after every day – especially in warmer regions!

| Step | Description |
|---|---|
| 1 | Remove the lid with the scrubber. |
| 2 | Remove the scrubber from the lid. |
| 3 | Let the lid and scrubber try. |
| 4 | Remove the counter lung with the breathing hose. |
| 5 | Spray some disinfectant (E.g. Buddy Clean or something similar) into the t-pieces. |
| 6 | Fill the loop (Counter lung and breathing hose with BOV) with fresh warm water and wait some time. |
| 7 | Empty the loop and rinse it with fresh warm water. The easiest way to do this is removing the breathing hose from the counter lung. |
| 8 | Let everything dry over the night. |

There are two short hoses on the lid. The cleaning of these hoses is not required so frequently. It only needs to be done after several weeks. Important is just to store the lid the way that the hoses can dry as well. If needed, you can rinse the **exhale hose** with fresh water. Make sure that you are holding the lid a bit angular, so that the water passes straight through. **Never try this with the inhale hose – as you will soak the oxygen cells with water!!**

For a full cleaning you can remove these two hoses as well.